

The impact of social media overuse on working memory capacity

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Abstract:

In the era of Web 3.0, excessive use of social media has emerged as a prevalent behavioral addiction phenomenon. A substantial body of research associates social media overuse with deleterious emotional outcomes such as anxiety and depression, as well as impairments in cognitive functions including procrastination and weakened cognitive control, the latter being a pivotal determinant in the development and persistence of behavioral addictions. Despite this, studies delving into the relationship between social media overuse and cognitive control remain in their infancy, with insufficient evidence to draw firm conclusions.

Working memory, central to various cognitive control processes—such as inhibition, switching, and updating—plays a foundational role in maintaining goals and manipulating information. It is commonly theorized that individuals with higher working memory capacity possess more ample cognitive control resources, potentially leading to superior cognitive control capabilities compared to those with lower working memory capacity. Therefore, there is a pressing need for empirical exploration of the differing working memory capacities among individuals with excessive social media use relative to those with normative usage, aiming to clarify the mechanistic pathways through which excessive reliance on social media can escalate into behavioral addiction.

In the current study, we employed a modified version of Young's Internet Addiction Test (IAT, Young, 2004) and the Bergen Facebook Addiction Scale (BFAS, Andreassen et al., 2012) to evaluate social media overuse. The adapted IAT comprised 20 items rated on a 5-point scale, with higher scores

signifying more severe social media overuse. Notably, our preliminary data ($n=1059$) indicated relatively high average scores among college students ($M = 56.98$, $SD = 13.52$), prompting us to adopt a quartile-based classification method akin to Cudo et al. (2019). Participants scoring at or below the first quartile (≤ 47) were designated as controls, while those at or above the third quartile (≥ 66) were classified as social media over-users. Furthermore, to qualify as social media over-users, participants had to report daily usage exceeding four hours and engagement with social media platforms five to seven days per week. Cross-validation was ensured by administering the adapted BFAS; only participants whose scores fell within the top 33% (≥ 56) for the overuse group and the bottom 33% (≤ 43) for the control group were included. Following rigorous screening, the study involved 40 participants (8 males, 31 females; mean age $M=18.93$ years, $SD=0.13$ years) who met the criteria for social media overuse and 73 participants (43 males, 30 females; mean age $M=19.10$ years, $SD=0.15$ years) serving as controls. We then investigated the working memory capacity of these groups using the *Operant Working Memory Span Task* (Conway et al., 2005) to discern potential differences in cognitive control abilities. In this task, participants consecutively performed n rounds of single-digit addition and subtraction operations, concurrently maintaining continuous memory of the second digit in each arithmetic sequence. After completing the calculations, they were required to recall the second digits of the n operations in order before advancing to the next trial. This performance in retaining numerical elements during arithmetic expressions serves as an indicator of their temporal informational integrity preservation, thereby shedding light on the sustained retention aspect of working memory function.

Statistically significant differences in working memory span were observed between the two groups, with the social media overuse group displaying lower working memory capacity ($M = 8.40$, $SD =$

1.69) compared to the control group ($M = 9.08$, $SD = 1.77$; $p = .049$, Cohen's $d = 0.391$), suggesting a decrement in social media over-users' capacity to maintain specific information during the manipulation of information, which is essential for successful cognitive controls.

In conclusion, the present finding demonstrates that the working memory capacity of social media over-users is significantly weakened than that of the control group, suggesting a depleted availability of cognitive control resources. This implies a compromised ability to sustain attention to goals and manipulate information in individuals with excessive social media use, heightening their susceptibility to disruptions triggered by relevant social media cues in everyday life scenarios.

Keywords: working memory capacity; social media overuse; cognitive control resource; behavioral addictions